

Triassic period ; and that the rareness of Triassic fossils was due not so much to the paucity of animal life during that period as to the fact that Triassic strata afforded no suitable conditions for the *preservation* of organic remains.

MISCELLANEOUS.

On the so-called Dimorphism in the Genus Cambarus.

By WALTER FAXON.

THE existence of two forms of the adult male in all the species of the genus *Cambarus* was discovered by Louis Agassiz and Henry James Clark. The differences between the two forms affect more especially the first pair of abdominal appendages, organs concerned in the act of coition, but also extend to the general form and sculpture of the body. In one form (unhappily called by Dr. Hagen the "second form"), the first pair of abdominal appendages have a structure nearly like that seen in all *young* males. The hooks on the third joint of the third (in some species of the third and fourth) pair of legs are small, and in the sculpture of the shell and shape of the claws this form approaches the female. In the other form (Hagen's "first form"), the articulation near the base of the first pair of abdominal appendages is gone, and the whole member is much more highly specialized, the terminal hooks being horny, more widely separated, and in every way more highly developed ; in those species with bifid tips to these appendages the branches are longer, slenderer, more widely separated, and stiffer ; the hooks on the thoracic legs are longer and more perfectly finished ; the sculpture of the whole body is more pronounced, and the claws are larger and more powerful. No intermediate conditions are found, and there is no relation between these forms and the size of the individual, the "second form" being large and the "first form" small, or *vice versa*. Hence we are forbidden to interpret the two forms as stages in ordinary development. Dr. Hagen has shown that in individuals of the "second form" the internal generative organs are smaller than in the "first form," but having only alcoholic material he was unable to determine any thing concerning the presence or absence of spermatozoa. He interprets the facts as a case of dimorphism, and surmises that the "second form" males are sterile individuals.

In the autumn of 1875 I received a lot of living *Cambarus rusticus*, Girard, from Kentucky, males of the "first form" and females, which bred freely in confinement. After pairing, three of the males moulted, and were thrown, while in the soft-shelled state, into alcohol, together with their exuviae. An examination of these specimens now reveals the fact that the soft-shelled specimens are

all of the "second form," their exuvie of the "first form"! After attaining the "first form" and after pairing the same individual has reverted to the "second form." It is now clear that we are not dealing with a case of true dimorphism, such as is well known among insects and plants, but it appears probable that the two forms of the crayfish are alternating periods in the life of the individual, the "first form" being assumed during the pairing-season, the "second form" during the intervals between the pairing-seasons. It is to be inferred that before the animal is again capable of reproduction another moult will bring it again into the "first form."

The fact that large collections, made at one time and place, often contain only one or a great preponderance of one form of the male is now explained.

I have also before me a male specimen of *Cambarus propinquus*, Girard, from Wisconsin, belonging to the Peabody Museum of Yale College, which was taken in the act of moulting. The old shell is "first form," the soft shell emerging from it is "second form."

It is remarkable that two forms of the male have not been detected in any other genus of crayfishes.

Fritz Müller ('Für Darwin') has pointed out the existence of two forms of the male in the genera *Tanais* and *Orchestia*, which he considers as truly dimorphic forms. It is possible that these are to be explained in the same way as the two forms of the male *Cambarus*.

Such a change as this connected with the reproductive period is unparalleled, so far as I know, among the Invertebrata, and even among the Vertebrata; the cases of partial atrophy of the generative organs or shedding of antlers (as in the stag) after the rut is over are hardly comparable.

At the time I had the specimens alive my attention had not been drawn to the questions relating to the two forms of the males, so that I failed to make anatomical examination, and the specimens have now lain too long in alcohol to be serviceable for internal dissection. I hope, however, that naturalists who are more favourably situated will be able to throw more light on this subject.

I will add that the males of extraordinary size which I have seen are all of the "first form." Do these very old individuals cease to moult? Do they become permanently capable of reproduction?—*Amer. Journ. Sci.*, January 1884, p. 42.

Museum of Comparative Zoology,
Cambridge, Mass.,
Nov. 12, 1883.

On Visual Organs in Solen. By Dr. B. SHARPE.

Dr. Benjamin Sharpe called attention to a remarkably primitive form of visual organ that he had discovered in the siphon of *Solenensis* and *S. vagina* (the common "razor-shell").

His attention was directed to the probable possession of visual